1-19-00 A

WESTMAN, CHAMPLIN & KELLY

A PROFESSIONAL ASSOCIATION

NICKOLAS E. WESTMAN
JUDSON K. CHAMPLIN
JOSEPH R. KELLY
STEVEN M. KOEHLER
DAVID D. BRUSH
JOHN D. VELDHUIS-KROEZE
DEIRDRE MEGLEY KVALE
THEODORE M. MAGEE
PETER S. DARDI, PH.D.
CHRISTOPHER R. CHRISTENSON
JOHN A. WIBERG
BRIAN D. KAUL

SUITE 1600 - INTERNATIONAL CENTRE
900 SECOND AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55402 3319

PATENT, TRADEMARK, COPYRIGHT
LAW AND RELATED ISSUES
(612) 334-3222 TELEPHONE
(612) 334-3312 FACSIMILE

January 18, 2000

VISALA CHEPURI GOSWITZ, PH.D.
PATENT AGENT

Express Mailing No. : EL418983019US

Assistant Commissioner for Patents
Washington, D.C. 20231

Re: New U.S. Patent Application of:
Applicant: Kevin R. Lilland et al.
For : A SYSTEM AND METHOD FOR MONITORING PRINT CONSUMABLES OF A PRINTING DEVICE
Our File : P31.12-0009

Dear Sir:

Enclosed for filing are the following papers in connection with the above-identified patent application:

1. Complete specification and claims.
   20 pages Specification
   10 pages claims
   1 page Abstract
2. Unexecuted Combined Declaration and Power of Attorney (3 pages).
3. 7 sheets of drawings.

The filing fee is not enclosed with this communication. Pursuant to 35 USC § 111 and 37 CFR §§ 1.53(b) and 1.53(f), the filing fee, executed Declaration will be filed separately.

A filing date under 37 CFR §§ 1.10(b) and 1.53(b) of **January 18, 2000** is respectfully requested. The enclosed materials are being sent "Express Mail Post Office to Addressee" as of the date of this letter.

Yours very truly,

Brian D. Kaul
Reg. No. 41,885

BDK:blt
Encs.

Express Mail No. EL418983019US

PATENT APPLICATION OF

KEVIN R. LILLAND AND STEVEN S. HOGE

ENTITLED

A SYSTEM AND METHOD FOR MONITORING PRINT CONSUMABLES OF A PRINTING DEVICE

Docket No. P31.12-0009

A SYSTEM AND METHOD FOR MONITORING PRINT CONSUMABLES OF A PRINTING DEVICE

BACKGROUND

The present invention relates to a system and method for monitoring print consumables of a printing device. More particularly, the present invention relates to a system and method for monitoring print consumables of a compact disc printing device.

A typical CD printing system includes a general purpose computer connected to a peripheral compact disc (CD) printing device. A software application running on the computer provides a print job, consisting of an image file and a copy number, to the CD printing device. The image file contains data on an image that is to be rendered by the CD printing device and the copy number indicates how many copies of the image file are to be rendered or the number of CD's the CD printing device is to render the image on. The CD printing device utilizes at least one print consumable to render an image onto a surface of a CD in accordance with the print job. Typical print consumables include, ink (e.g., inkjet based printing), toner (laser based printing), colored dye ribbons (dye sublimation based printing), and wax based ribbons (waxed thermal transfer based printing).

The process of rendering a print job of a CD printing system, once started, is generally automated by the CD printing device. After the image file is rendered onto one CD, another CD is loaded into the printing device for printing, and repeated until all of the copies of the print job are rendered. Since the copy number of typical CD print jobs is quite large, it is common for the CD printing device to be left unattended for long periods of time. As a result, it is possible that the print consumable that is available to the CD printing device can become unexpectedly exhausted during the rendering of a print job unbeknownst to the operator until he or she returns to check on the CD printing device. This can result in higher production costs due to a reduction in efficiency and the loss of the CD's on which the image could not be properly rendered due to the lack of print consumable. Additionally, in an attempt to avoid this problem, it is common for print consumables to be replaced prematurely to ensure that an adequate amount of print consumable is available to the CD printing device to completely render a print job. The discarding of the prematurely further increases production costs.

In the current state of the art of computerized printing devices, use and remaining levels of print consumables are determined as each print job is rendered. The quantity of print

consumables remaining in the printing device is calculated after printing an image by subtracting the amount of print consumable used by the printing device to render the image from a known quantity of print consumable that was available to the printing device immediately prior to the rendering of the image. This method is illustrated in FIG. 1. At 10, the software application instructs the printing device to print X copies of an image file. At 12, a single copy of the image file is rendered by the printing device onto a print media, such as a compact disc. At 14, the amount of print consumable that is available to the printing device is updated by subtracting the amount of print consumable used to render the image file from the amount of print consumable that was available to the printing device just prior to the rendering of the image file. If there are still copies to be rendered at step 16, the method returns to step B to render another copy of the image file. If, at step 16, all the copies of the image file have been rendered, then the print job has been completely rendered as indicated by step 18.

Although the current art is acceptable in printing individual short runs while the printing device is attended, the current art does not solve the above-described problem associated with CD printing systems involving large print jobs. It would, therefore, be advantageous to calculate the amount of print consumables a given print job will

require prior to commencing the rendering of the print job. If the calculation reveals that an insufficient quantity of print consumable is available to the printing device to complete the rendering of the print, the rendering of the print job can be interrupted before the operator of the CD printing device leaves the CD printing device unattended.

SUMMARY

The present invention relates to a system and method for monitoring print consumables of a compact disc (CD) printing device. The method generally compares an amount of print consumable that is available to the CD printing device to an amount of print consumable that is needed by the CD printing device to render a print job. The print job includes at least one image file and indicates the number of copies of the image file that are to be rendered. The CD printing device renders the print job if there is sufficient print consumable available. The rendering of the print job is interrupted if there is not a sufficient amount of print consumable available to render the print job. The disclosed system is configured to implement the described method.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a flowchart illustrating a method used by the prior art to monitor print consumable usage of a computerized printing device.

FIG. 2 shows a simplified block diagram of a compact disc printing system in accordance with an embodiment of the invention.

FIG. 3 shows a perspective drawing of a compact disc printing device with parts broken away.

FIG. 4 shows a flowchart of a method used to monitor print consumable usage of a compact disc printing device in accordance with one embodiment of the invention.

FIG. 5 shows a flowchart of a method used to render a print job in accordance with one embodiment of the invention.

FIG. 6 shows a flowchart of a used to interrupt a print job in accordance with one embodiment of the invention.

FIG. 7 shows a flowchart of a method used to render a batch print job in accordance with one embodiment of the invention.

DETAILED DESCRIPTION

A compact disc (CD) printing system utilizing aspects of the present invention, generally designated as 20, is shown in FIG. 2. The system includes a general purpose computer 22 having a memory 24 and an input/output (I/O) port 26, a software application 28 configured to run on computer

22, a print consumables monitoring (PCM) module 30, and a peripheral CD printing device 32. Software application 28 is configured to produce a print job, expressed in a language that can be understood by CD printing device 32, and communicate the print job to CD printing device 32 through I/O port 26. One embodiment of the print job includes at least one image file and a copy number. The image file generally contains data of an image, text, or both, that is to be rendered onto a CD by CD printing device 32. The copy number indicates the number of copies of the image file that are to be rendered or the number of CD's the image is to be rendered on. The present invention is equally applicable to monitoring print consumables used to render print jobs onto digital video discs, recordable CD's, CD-ROM's, and other CD-like media. To simplify the discussion of the invention, references to a CD are intended to include all forms of CD-like media.

CD printing device 32 is electronically coupled to computer 22 at I/O port 26. CD printing device 32 utilizes at least one print consumable to render an image file onto a CD. Examples of print consumables include, ink (e.g., inkjet based printing), toner (laser based printing), colored dye ribbons (dye sublimation based printing), and waxed based ribbons (wax thermal transfer base printing). CD printing devices 32 can be adapted to automatically load and unload CD's in order to

process a large number of CDs without the aid of an operator. As a result, CD printing device 32 can be left unattended during the rendering of a print job that includes a large copy number. An example of a suitable CD printing device 32 is the Signature II™ CD color printer manufactured by Primera Technology, Inc. of Plymouth, Minnesota, and described in U.S. Patent 5,927,208, which is incorporated herein by reference.

In one embodiment of the invention, CD printing device 32 is an inkjet printer such as that shown in FIG. 3. CD printing device 32 generally includes a housing 34, a tray 36, CD loading and positioning machinery 38, a print head 40. A tray 36 is configured to hold a CD 42 having a surface 44 upon which an image is to be rendered. Tray 36 is shown in its extended position where a CD 42 can be placed onto tray 36. Tray 36 also has a printing position where tray 36 is slid into housing 34 such that a CD 42 on tray 36 is positioned for printing beneath print head 40. Tray 36 is moved between the extended position and the printing position using CD loading and positioning machinery 38. Print head 40, shown as a conventional inkjet print head containing an ink print consumable, is used to render an image onto a CD 42 in accordance with a print job. Print head 40 is mounted on a lateral slide rod 46. Movement of print head 40 is controlled by belt 48 that is mounted on suitable pulleys 50 and is driven

by a stepper motor 52. The CD printing device 32 shown in FIG. 3 can be adapted to automatically load and unload CD's 42 onto tray 36 such that a large number of CD's 42 can be loaded for printing without the aid of an operator.

PCM module 30 runs on computer 22 and communicates with memory 24 and software application 28. PCM module 30 is configured to maintain a remaining print consumable amount in memory 24. The remaining print consumable amount relates to the amount of print consumable that is currently available to or loaded in CD printing device 32. PCM module 30 can periodically update the remaining print consumable amount in memory 24 by subtracting the amount of print consumable used by CD printing device 32 to render an image. PCM module 30 is further configured to communicate with software application 28 and inform software application 28 when the remaining amount of print consumable that is available to or loaded in CD printing device 32 is insufficient to completely render the current print job. When PCM module 30 notifies software application 28 that the remaining amount of print consumable is insufficient to process the print job, software application 28 can interrupt the rendering of the print job.

In another embodiment of the invention (not shown), CD printing device 22 includes a processor and a memory. This "smart" printing device includes

PCM module 30 which maintains and updates the remaining print consumables amount that stored in the memory of the "smart" printing device. For this embodiment, software application 28, running on a general purpose computer, provides the "smart" CD printing device with a print job and PCM module 30 notifies software application 28 when the remaining print consumable amount is insufficient to completely render the print job.

FIG. 4 shows the general method used by the present invention to monitor usage and remaining levels of a print consumable of the printing device. A print job is produced by software application 28 and received by PCM module 30 at step 54. One embodiment of the print job includes a print file and a copy number as discussed above. At step 56, a requested print consumable amount is determined by PCM module 30 that relates to the amount of print consumable needed to render the print job. In one embodiment of the invention, the requested print consumable amount is determined by calculating the amount of print consumable needed to render a single copy of the image file or a single print consumable amount, and multiplying the single print consumable amount by the copy number. At step 58, a remaining print consumable amount relating to the amount of print consumable that is currently available to CD printing device 32 is obtained from memory by PCM module 30. Next, the requested print consumable

amount is compared to the remaining print consumable amount at step 60. If the requested print consumable amount does not exceed the remaining print consumable amount, software application 28 sends the print job to CD printing device 32 to render the print job at step 62. After all of the copies of the image file of the print job have been rendered, the rendering of the print job is completed as indicated at step 64. If the requested print consumable amount exceeds the remaining print consumable amount, then the rendering of the print job is interrupted at step 66 by software application 28 and the print job is not sent to CD printing device 32 for rendering.

FIG. 5 shows one embodiment of the rendering step 62 where the remaining print consumable amount is updated after each copy of the image file of the print job is rendered by CD printing device 32. In this embodiment, software application 28 instructs CD printing device 32 to render a single copy of the image file at step 68. At step 70, the remaining print consumable amount is updated by PCM module 30 by subtracting the amount of print consumable needed to render the single copy of the image file or a single print consumable amount from the remaining print consumable amount. At step 72, software application 28 determines whether all of the copies of the print job have been rendered. If more copies are to be rendered, the method returns to step 68 where another copy of the image file is

rendered by CD printing device 32 and the remaining print consumable amount is updated by PCM module 30 at step 70. If all the copies have been rendered, the print job is completed as indicated by step 74.

In one embodiment of the interrupting step 66, software application 28 warns the user that the print job cannot be completely rendered. Alternatively, PCM module 30 can be configured to provide the warning to the user. The warning may consist of an alarm and a text message which indicates that the remaining print consumable amount is insufficient to completely render the print job.

One embodiment of the print job includes a print quality setting relating to the amount of print consumable used to print the image of the image file, thus affecting the requested print consumable amount for the print job. One embodiment of interrupting step 66 includes providing the user with an option of adjusting the print quality setting of the print job. By appropriately adjusting the print quality setting of the print job, the requested print consumable amount can be reduced such that it does not exceed the remaining print consumable amount.

FIG. 6 shows yet another embodiment of the interrupting step 66 in which either software application 28 or PCM module 30 provides the user with at least one of the options listed in step 76. The options include: A. adjusting the current copy number X to a smaller copy number Y; B. adjusting the

amount of the remaining print consumable; C. rendering the print job without any adjustments; and D. canceling the rendering of the print job. Each of these listed options constitutes an individual embodiment of the invention. However, one embodiment of the invention includes providing the user with some or all of the options listed in step 76 including the option to reduce the print quality setting of the print job mentioned above. At step 78, the option selected by the user is determined.

If option A. is selected, the method moves to step 80 where the user is prompted to enter a new copy number for the print job. At step 82, a requested print consumable amount is determined by PCM module 30 based upon the new copy number and the single print consumable amount as in step 56 of FIG. 4. Finally, the method returns to step 60 of the flowchart of FIG. 4 where the general method continues as previously discussed.

If the user selects option B., the user is prompted to replace the print consumable currently loaded in CD printing device 32, as indicated at step 84. In one embodiment of step 84, the user is first prompted to provide a filename for the print consumable that is to be replaced. Once entered, PCM module 30 stores the remaining print consumable amount of the print consumable in memory 24 under the filename provided by the user for later retrieval by the user. Next, the user is prompted to replace the

print consumable currently loaded in CD printing device 32 with a different print consumable. This may involve, for example, replacing an ink cartridge of an inkjet printer, replacing a toner cartridge of a laser printer, or replacing a wax ribbon of a wax thermal transfer base printer.

At step 86, it is determined whether the user replaced the print consumables with a new or a used print consumable. If the user replaced the print consumable with a new print consumable, PCM module 30 updates the remaining print consumable amount to the new print consumable amount at step 88. The new print consumable amount is typically a quantity of print consumable that is known to PCM module 30 or one that can be provided by the user. After updating the remaining print consumable amount, the method continues at step 60 of FIG. 4. If the user replaces the print consumable with a used print consumable, the user is prompted, at step 90, to provide a filename that relates to the used print consumable. The filename identifies data in memory 24 relating to the amount of print consumable stored by the used print consumable, which is retrieved by PCM module 30 at step 92 and used to update the remaining print consumable amount at step 92. Finally, the method continues at step 60 of the flowchart of FIG. 4.

If the user selects option C in step 76, the method moves to step 62 of FIG. 4 where software

application 28 instructs CD printing device 32 to render the print job as previously discussed. If the user selects option D at step 78, the method moves to step 64 and a print job is not rendered by CD printing device 32.

Another embodiment of the print job is a batch print job. The batch print job includes multiple image files, each of which are to be rendered by a printing device. A copy number for the batch print job can be used to indicate the total number of copies of the image files in the batch print job that are to be rendered by the printing device. Additionally, the batch print job can include a print quality setting relating to the amount of print consumable used to render the image files, thus affecting the requested print consumable amount for the print job. One example of a batch print job includes image files that are to be rendered onto a CD using, for example, CD printing device 32. Although the various embodiments of the invention relating to the batch print job described below are directed toward monitoring print consumables of CD printing device 32, the described embodiments are equally applicable to printing devices that are adapted to render other varieties of batch print jobs. For example, the present invention can be used to monitor print consumables of a printing device that is adapted to render a batch

print job consisting of image files of addresses which are to be rendered on labels or envelopes.

The method used to monitor the rendering of a batch print job generally follows the method illustrated in FIG. 4. A print job, in the form of the batch print job, is received at step 54. A requested print consumable amount is estimated by PCM module 30 at the step of 56. This is accomplished by selecting one of the image files that is to be printed first and determining a single print consumable amount for the image file, defined as an amount to print consumable needed by the printing device, such as CD printing device 32, to render the selected image file. The single print consumable amount is then multiplied by the number of image files that are to be rendered to estimate the requested print consumable amount for the batch job. This generally results in a reasonable estimation of the amount of print consumable needed to render the batch print job since the single print consumable amounts for the image files are relatively equal.

At step 58, the remaining print consumable amount that is available to or loaded in the printing device is obtained from memory 24 by PCM module 30. At step 60, the requested print consumable amount is compared to the remaining print consumable amount. If the requested print consumable amount exceeds the remaining print consumable amount, the rendering of

the print job is interrupted at step 66, as previously discussed.

In one embodiment of the invention, software application 28 instructs the printing device to render each of the image files of the batch print job when the requested print consumable amount does not exceed the requested print consumable amount, as indicated at step 62. Once each of the image files are rendered in accordance with the batch print job, the print job is completed as indicated at step 64.

In another embodiment of the invention, step 62 of FIG. 4 is implemented using the flowchart of FIG. 7 beginning with step 96. At step 96, software application 28 instructs CD printing device 32 to render the first or selected image file. At step 98, the remaining print consumable amount is updated by PCM module 30 by subtracting the single print consumable amount for the selected image file. At step 100, PCM module 30 determines whether the remaining print consumable has been unexpectedly exhausted. Step 100 of FIG. 7 exists due to the assumption that each of the image files in the batch print job have similar single print consumable amounts and that the requested print consumable amount is estimated based upon the single print consumable amount of one of the image files. Consequently, it is possible for PCM module 30 to underestimate the amount of print consumable needed to render the batch print job. Thus, the purpose of

step 100 is to interrupt the rendering of additional image files when the remaining print consumable becomes unexpectedly exhausted. If the remaining print consumables have not been exhausted, the method moves to step 102 where software application 28 determines whether all of the image files of the batch print job have been rendered. If all of the image files have been rendered, the method returns to step 64 of FIG. 4 and the processing of the batch print job is competed. If there are still image files to be rendered at step 102, then the next image file is rendered by CD printing device 32 at step 96 and the remaining print consumable amount is updated at step 98 by subtracting the single print consumable amount for the image file just rendered. In this manner, the amount of print consumable that is available to CD printing device 32 is accurately maintained by PCM module 30. Steps 96 and 98 will repeat unless the remaining print consumables have been unexpectedly exhausted (checked at step 100) or all of the image files of the batch print job have been rendered (checked at step 102).

If, at step 100, PCM module 30 determines that the remaining print consumables have been exhausted, software application 28 interrupts the rendering of the print job at step 104. In one embodiment of step 104, a warning is provided to the user indicating that the print consumables of CD printing device 32 have been exhausted. Another

embodiment of step 104 includes providing the user with an option of adjusting the print quality setting of the batch print job. By reducing the print quality setting it is possible to reduce the requested print consumable amount such that it does not exceed the remaining print consumable amount.

In yet another embodiment of step 104, the user is provided with at least one of the options shown in step 106 of FIG. 7. The options can include an option to: A. adjust the amount of remaining print consumable; B. ignore the interruption and continue rendering the batch print job; and C. cancel the rendering of the batch print job. Each of these listed options constitutes an individual embodiment of the invention. Additional embodiments involve providing the user with some or all of the options listed in step 106 including the option to reduce the print quality setting of the print job mentioned above.

If the user selects option A., step 108 directs the method to step 110 where the remaining print consumable amount can be adjusted by the user. Prior to replacing the print consumable, the user can be asked to provide a filename for the print consumable that is to be replaced. The remaining print consumable amount relating to the print consumable that is being replaced is stored in memory 24 by PCM module 30 under the given filename. The user may then either insert a new print consumable or

a previously used print consumable and the remaining print consumable amount for CD printing device 32 is updated or reset by PCM module 30 to reflect the new amount of print consumable as previously discussed. The method then continues from step 60 of FIG. 4. If option B. is selected, step 108 directs the method to step 102 where the process of rendering the image files of the batch print job continues as discussed above. In one embodiment of the invention, the interrupting step 104 and the step 100 where it is determined whether the remaining print consumable has been exhausted, can each be disabled when option B. is selected. Finally, if option C. is chosen, the method returns to step 64 where the processing of the batch print job terminated.

The described invention provides a method for monitoring print consumables of a printing device and determining whether there is a sufficient amount of print consumable loaded in the printing device to completely render a print job. The print job is rendered by the printing device if a sufficient amount of print consumable is loaded in the printing device. The print job is interrupted if there is not a sufficient amount of print consumable loaded in the printing device to completely render the print job. By using the present invention, the need to prematurely replace print consumables of the printing device can be avoided and large print jobs can be rendered without worrying about whether there is a

sufficient amount of print consumable available to completely process the print job.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. A method for monitoring at least one print consumable of a compact disc (CD) printing device, comprising:

(a) receiving a print job, wherein the print job includes an image file and a copy number representing the number of copies of the image file that are to be printed;

(b) determining a requested print consumable amount defined as an amount of print consumable needed to render the print job;

(c) obtaining a remaining print consumable amount defined as an amount of print consumable that is loaded in the printing device;

(d) comparing the requested print consumable amount to the remaining print consumable amount;

(e) interrupting rendering the print job, prior to rendering the print job, when the requested print consumable amount exceeds the remaining print consumable amount;

(f) rendering the print job with the CD printing device when the requested print consumable amount does not

exceed the remaining print consumable amount.

2. The method of claim 1, wherein the interrupting step (e) includes warning the user that the print job cannot be completed.

3. The method of claim 1, wherein the interrupting step (e) comprises providing the user with an option of adjusting the copy number of the print job.

4. The method of claim 1, wherein:

the print job further includes a print quality setting relating to an amount of print consumable used to print an image; and

the interrupting step (e) comprises providing the user with the option of adjusting the print quality setting of the print job, whereby the requested print consumable amount can be reduced.

5. The method of claim 1, wherein the determining step (b) further comprises determining a single print consumable amount defined as the amount of print consumable needed to print a single copy of the image file, wherein the requested print

consumable amount is determined by multiplying the single print consumable amount by the copy number.

6. The method of claim 5, wherein:

the determining step (b) further comprises calculating a maximum copy number representing a maximum number of copies of the image file that can be printed based upon the remaining print consumable amount and the single print consumable amount; and

the interrupting step (e) comprises providing the user with at least one option selected from the group consisting of:

adjusting the copy number of the print job to the maximum copy number; and

adjusting the copy number of the print job to a number that is less than the maximum copy number.

7. The method of claim 1, wherein the interrupting step (e) comprises providing the user with the option of adjusting the amount of print consumable that is available.

8. The method of claim 7, wherein:

the print consumable is stored in a first print cartridge; and

the interrupting step (e) further comprises:

(e)(i) receiving a filename for the first print cartridge;

(e)(ii) saving the remaining print consumable amount of the first print cartridge in a memory under the filename;

(e)(iii) replacing the first print cartridge with a second print cartridge having a remaining print consumable amount;

(e)(iv) resetting the remaining print consumable amount to the remaining print consumable amount of the second cartridge; and

(e)(v) returning to the comparing step (d).

9. The method of claim 8, wherein the second print cartridge is one of a new print cartridge having a maximum remaining print consumable amount and a used print cartridge having a remaining print consumable amount that is stored in memory under a filename.

10. The method of claim 1, wherein the interrupting step (e) comprises providing the user

with an option of canceling the rendering of the print job.

11. The method of claim 1, wherein the interrupting step (e) comprises providing the user with an option of rendering the print job without any adjustments.

12. The method of claim 1, wherein the rendering step (f) further comprises updating the remaining print consumable amount by deducting the requested print consumable amount.

13. The method of claim 5, wherein the rendering step (f) comprises:

(f)(i) printing a single copy of the image file;

(f)(ii) deducting the single print consumable amount from the remaining print consumable amount; and

(f)(iii) repeating the printing step (f)(i) and the deducting step (f)(ii) until the print job is completely rendered.

14. The method of claim 1, wherein the print consumable of the CD printing device is one of ink, toner, colored dye ribbon, and wax based ribbon.

15. A method for monitoring at least one print consumable of a printing device, comprising:

(a) receiving a print job from a user, wherein the print job includes a number of image files that are to be rendered;

(b) determining a single print consumable amount for an image file of the print job defined as an amount of print consumable needed by the printing device to render the image file;

(c) estimating a requested print consumable amount needed to render the print job by multiplying the single print consumable amount by the number of image files that are to be rendered;

(d) obtaining a remaining print consumable amount defined as an amount of print consumable that is available to the printing device;

(e) comparing the requested print consumable amount to the remaining print consumable amount;

(f) interrupting rendering the print job, prior to rendering the image file, when the requested print consumable amount exceeds the remaining print consumable amount;

(g) rendering the image file with the printing device when the requested print consumable amount does not exceed the remaining print consumable amount;

(h) updating the remaining print consumable amount by subtracting the single print consumable amount of the image file;

(i) determining whether the remaining print consumable amount has been exhausted;

(j) interrupting the rendering of the print job, when the remaining print consumable amount has been exhausted;

(k) determining whether all of the image files of the print job have been rendered;

(m) determining a single print consumable amount of another image file of the print job if all of the image files have not been rendered;

(n) rendering the image file; and

(o) returning to step (h).

16. The method of claim 15, wherein the interrupting step (g) includes providing the user with at least one of a warning that the print job cannot be completed, an option of reducing the number

of image files to be rendered, an option of canceling the print job, an option of adjusting the remaining print consumable amount, and an option of rendering the print job.

17. The method of claim 15, wherein the interrupting step (k) includes providing the user with at least one of a warning that the print job cannot be completed, an option of canceling the print job, an option of adjusting the remaining print consumable amount, and an option of rendering the print job.

18. The method of claim 15, wherein:

the print job further includes a print quality setting relating to the amount of print consumable used to print an image; and

the interrupting step (g) comprises providing the user with the option of adjusting the print quality setting of the print job.

20. The method of claim 15, wherein the print consumable of the CD printing device is one of ink, toner, colored dye ribbon, and wax based ribbon.

21. The method of claim 15, wherein the printing device is a CD printing device.

22. The method of claim 15, wherein:

the image files of the print job relate to addresses; and

the printing device is adapted to render the image files onto one of envelopes and labels.

23. A system for monitoring print consumables of a compact disc (CD) printing device, the system comprising:

a computer having a processor, an input/output (I/O) port connected to the CD printing device, and a memory;

a software application executable by the processor and configured to prepare a print job and to communicate with the CD printing device, through the I/O port, to render the print job, wherein the print job includes an image file and a copy number representing the number of copies of the image file that are to be printed; and

a print consumables monitoring module configured to:

communicate with the software application and the memory;

maintain a remaining print consumable amount representing the amount of

print consumable currently available to the CD printing device in the memory;

determine a requested print consumable amount defined as an amount of print consumable needed to process the print job; and

compare the remaining print consumable amount to the requested print consumable amount;

whereby the rendering of the print job is interrupted when the requested print consumable amount exceeds the remaining print consumable amount.

A SYSTEM AND METHOD FOR MONITORING PRINT CONSUMABLES OF A PRINTING DEVICE

ABSTRACT

The present invention relates to a system and method for monitoring print consumables of a compact disc (CD) printing device. The method generally compares an amount of print consumable that is available to the CD printing device to an amount of print consumable that is needed by the CD printing device to render a print job. The print job includes at least one image file and indicates the number of copies of the image file that are to be rendered. The CD printing device renders the print job if there is sufficient print consumable available. The rendering of the print job is interrupted if there is not a sufficient amount of print consumable available to render the print job. The disclosed system is configured to implement the described method.

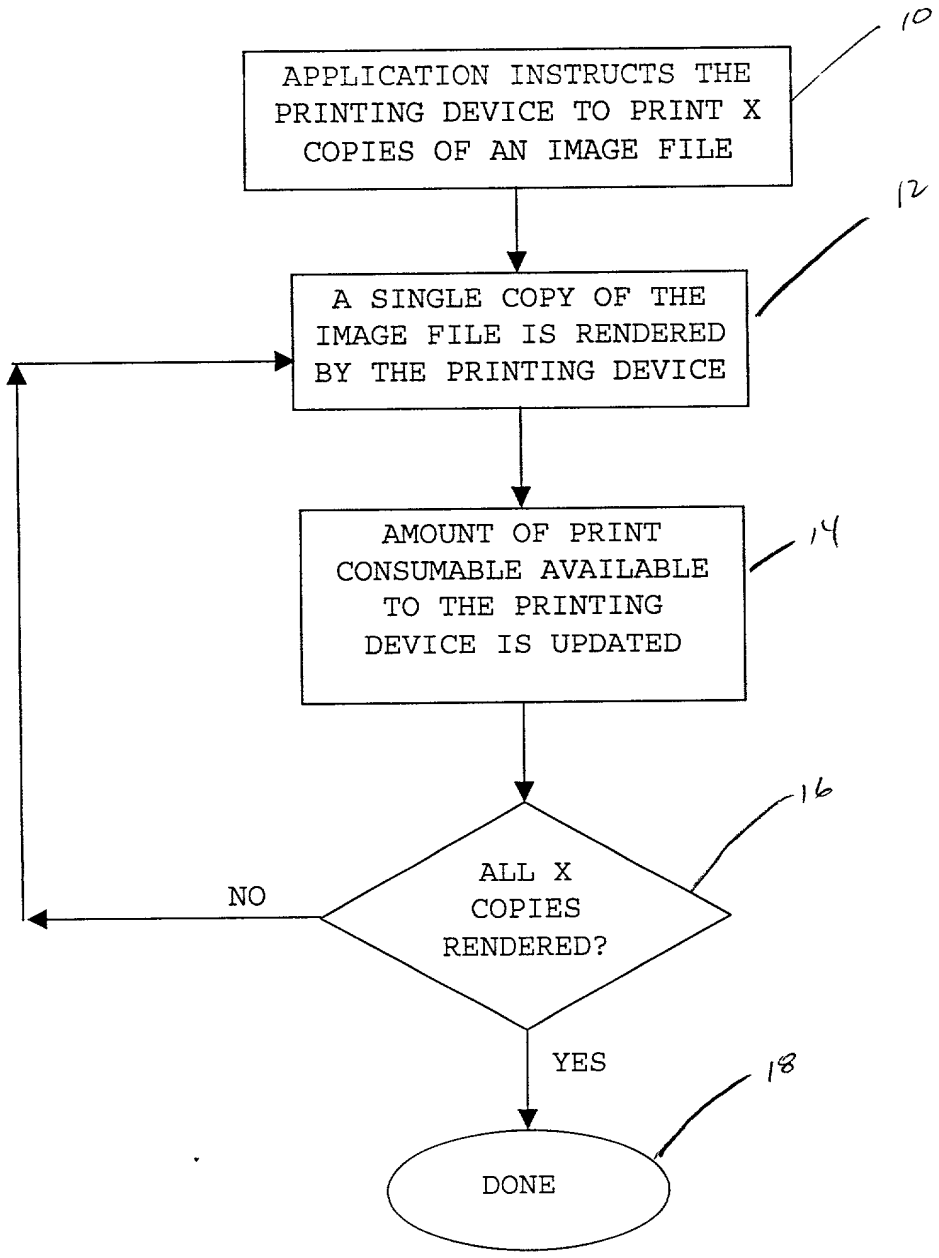

Fig. 1
(PRIOR ART)

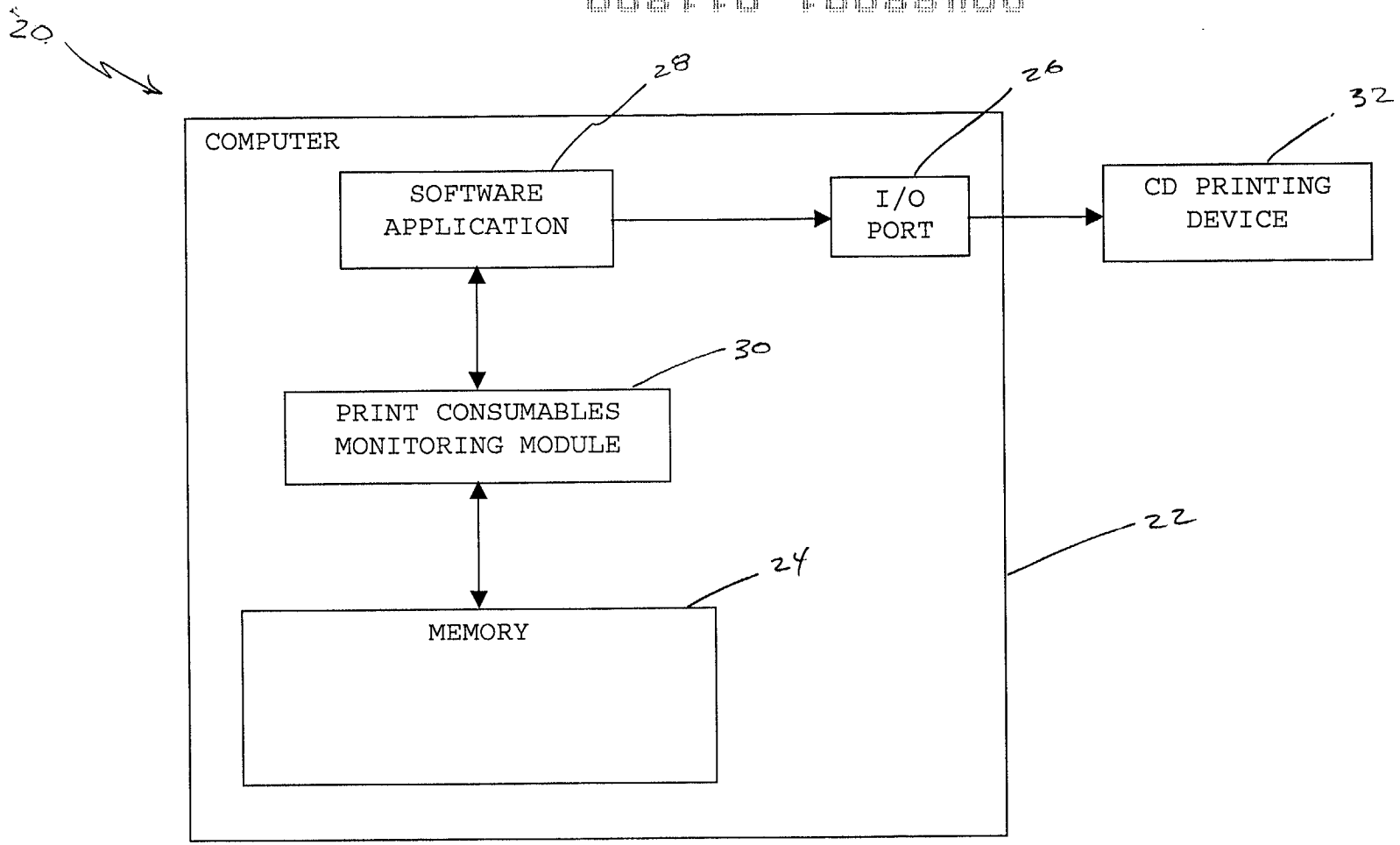

Fig. 2

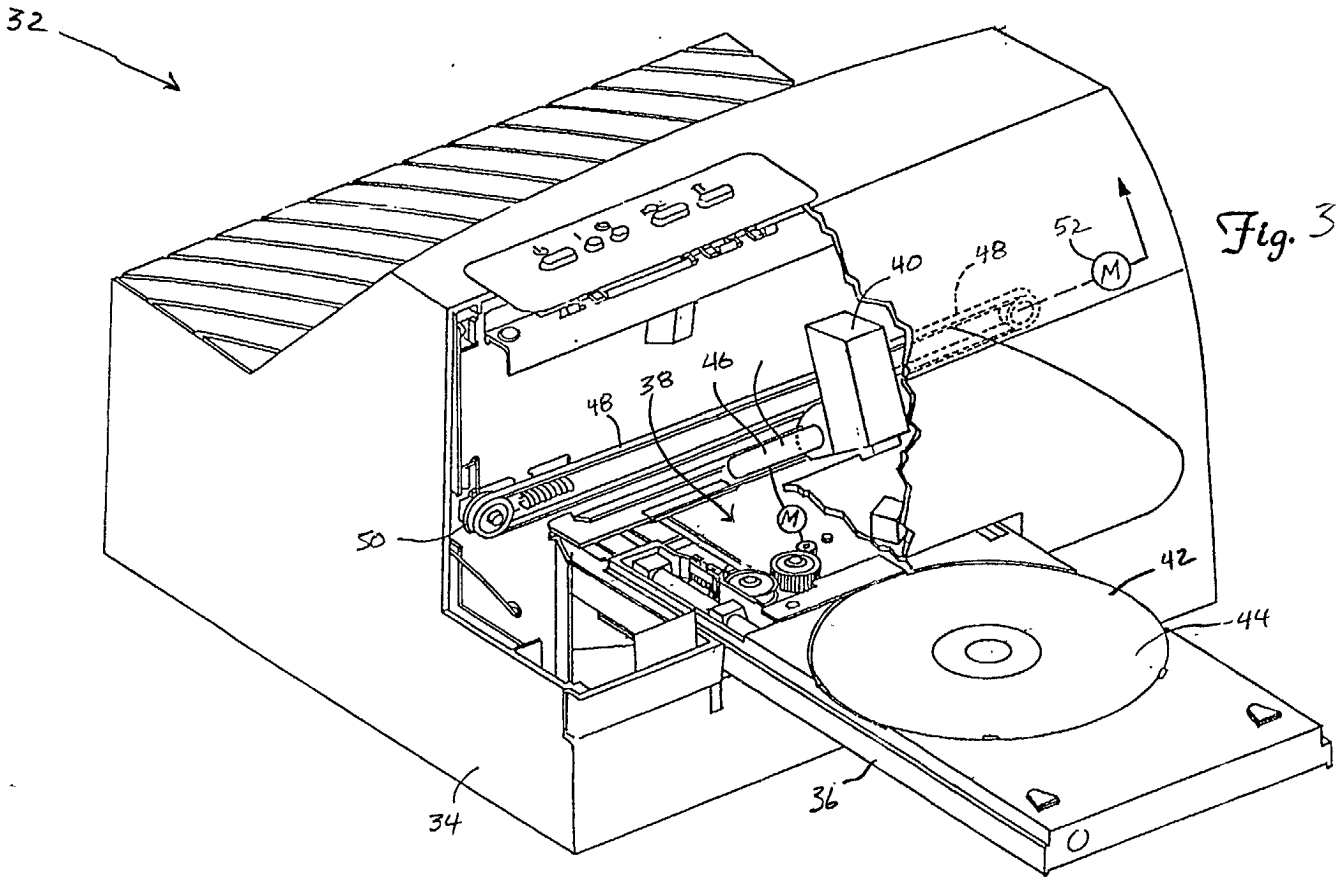

Fig. 3

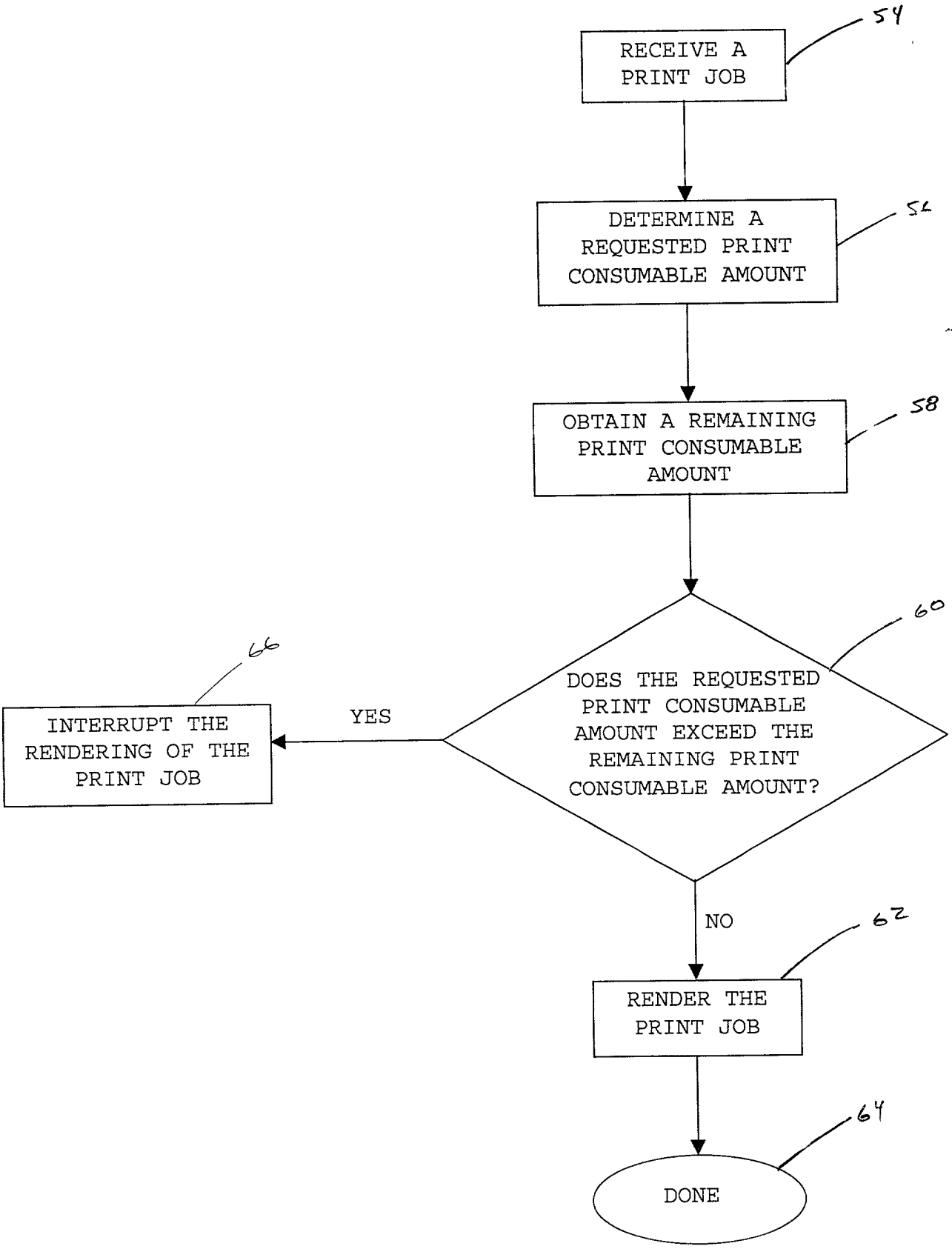
RECEIVE A PRINT JOB
54
DETERMINE A REQUESTED PRINT CONSUMABLE AMOUNT
52
OBTAIN A REMAINING PRINT CONSUMABLE AMOUNT
58
DOES THE REQUESTED PRINT CONSUMABLE AMOUNT EXCEED THE REMAINING PRINT CONSUMABLE AMOUNT?
60
YES
INTERRUPT THE RENDERING OF THE PRINT JOB
66
NO
RENDER THE PRINT JOB
62
DONE
64

Fig. 4

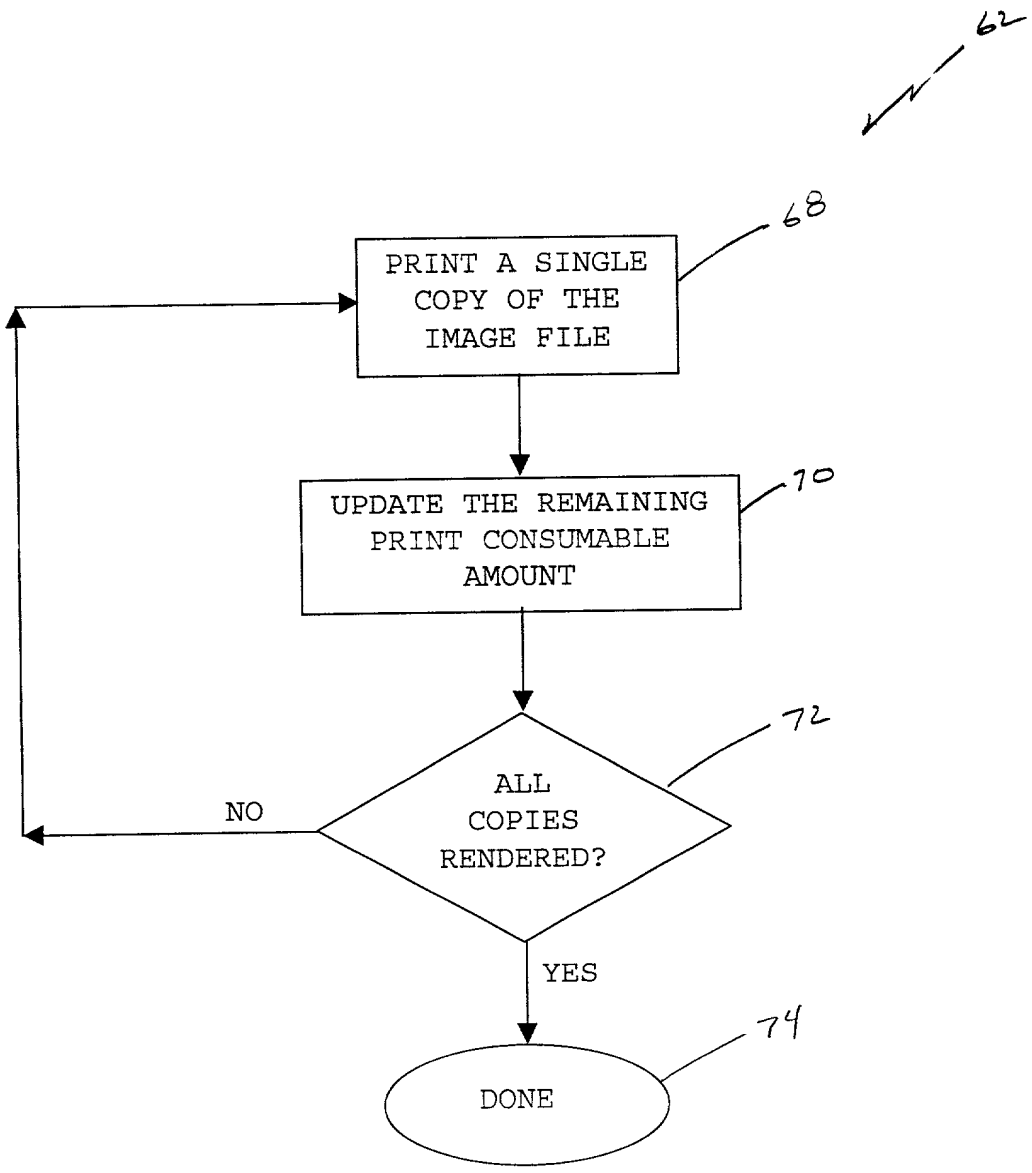
62
68
PRINT A SINGLE COPY OF THE IMAGE FILE
70
UPDATE THE REMAINING PRINT CONSUMABLE AMOUNT
72
ALL COPIES RENDERED?
NO
YES
74
DONE

FIG. 5

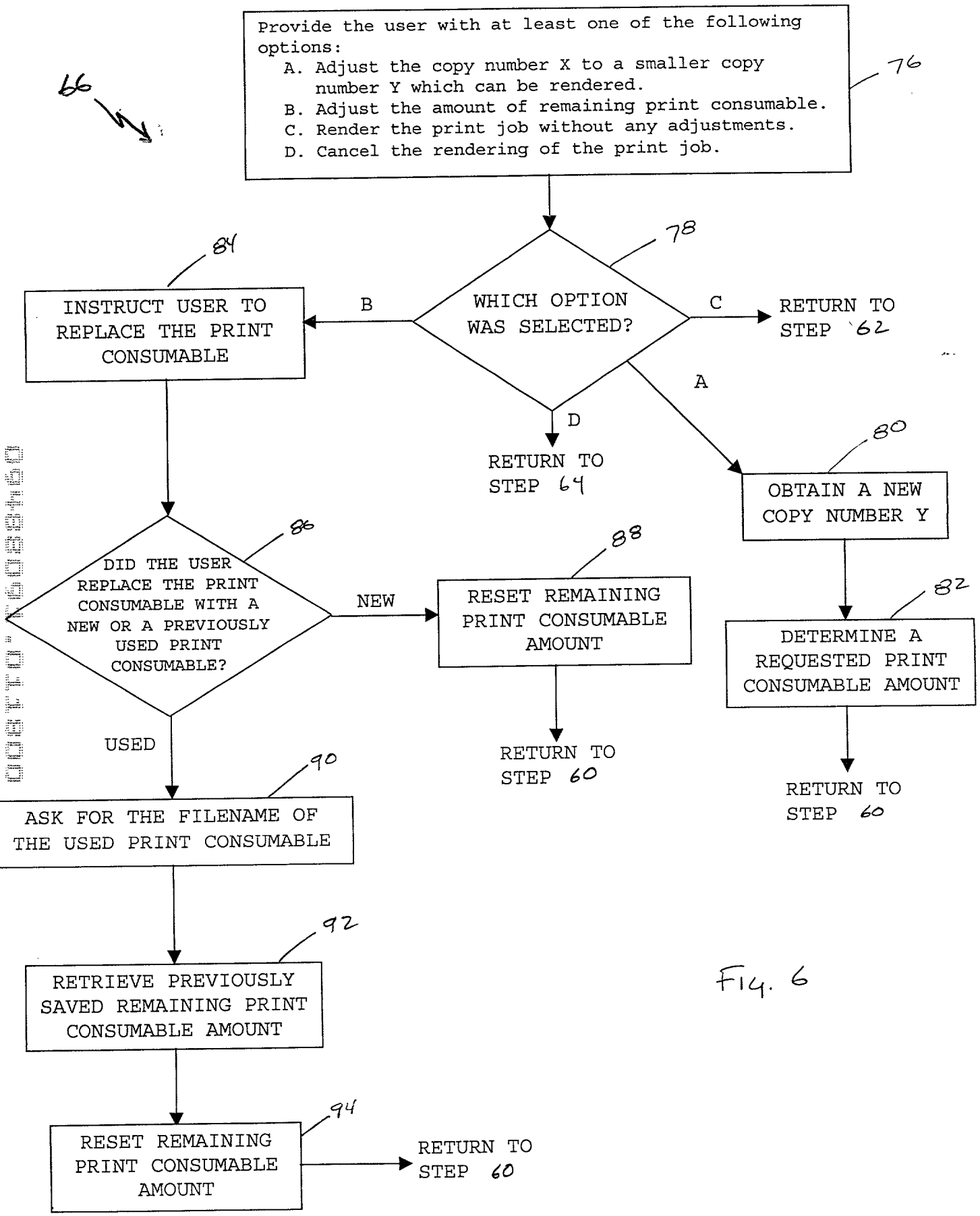
66
Provide the user with at least one of the following options:
A. Adjust the copy number X to a smaller copy number Y which can be rendered.
B. Adjust the amount of remaining print consumable.
C. Render the print job without any adjustments.
D. Cancel the rendering of the print job.
76
78
WHICH OPTION WAS SELECTED?
B
C
RETURN TO STEP 62
A
D
RETURN TO STEP 64
84
INSTRUCT USER TO REPLACE THE PRINT CONSUMABLE
80
OBTAIN A NEW COPY NUMBER Y
82
DETERMINE A REQUESTED PRINT CONSUMABLE AMOUNT
RETURN TO STEP 60
86
DID THE USER REPLACE THE PRINT CONSUMABLE WITH A NEW OR A PREVIOUSLY USED PRINT CONSUMABLE?
NEW
88
RESET REMAINING PRINT CONSUMABLE AMOUNT
RETURN TO STEP 60
USED
90
ASK FOR THE FILENAME OF THE USED PRINT CONSUMABLE
92
RETRIEVE PREVIOUSLY SAVED REMAINING PRINT CONSUMABLE AMOUNT
94
RESET REMAINING PRINT CONSUMABLE AMOUNT
RETURN TO STEP 60

Fig. 6

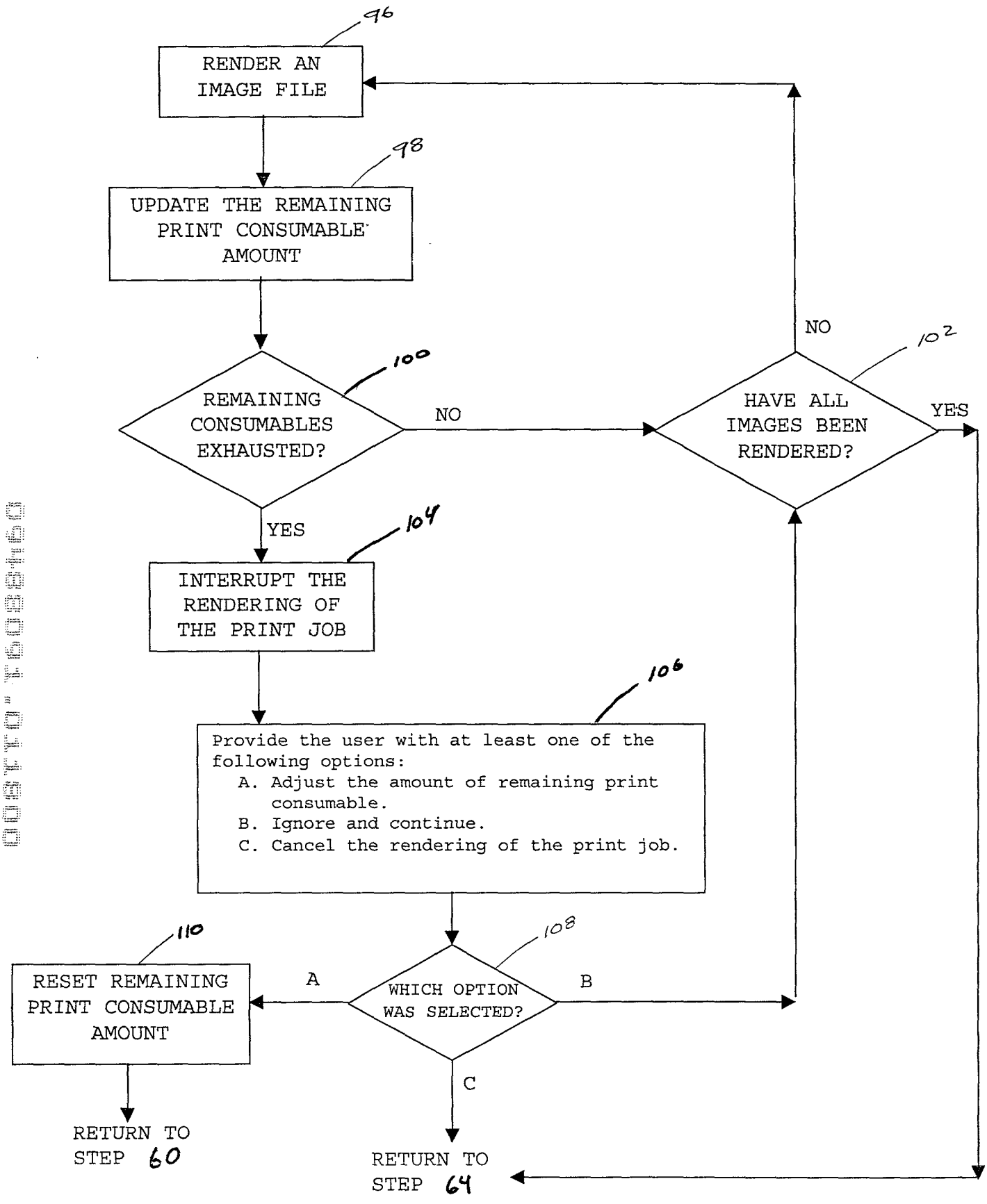
96
RENDER AN IMAGE FILE
98
UPDATE THE REMAINING PRINT CONSUMABLE AMOUNT
100
REMAINING CONSUMABLES EXHAUSTED?
NO
YES
102
HAVE ALL IMAGES BEEN RENDERED?
NO
YES
104
INTERRUPT THE RENDERING OF THE PRINT JOB
106
Provide the user with at least one of the following options:
A. Adjust the amount of remaining print consumable.
B. Ignore and continue.
C. Cancel the rendering of the print job.
108
WHICH OPTION WAS SELECTED?
A
B
C
110
RESET REMAINING PRINT CONSUMABLE AMOUNT
RETURN TO STEP 60
RETURN TO STEP 64

Fig. 7

COMBINED DECLARATION AND POWER OF ATTORNEY IN ORIGINAL APPLICATION

Attorney Docket No.

P31.12-0009

SPECIFICATION AND INVENTORSHIP IDENTIFICATION

As a below named inventor, I declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor of the subject matter which is claimed, and for which a patent is sought, on the invention entitled A SYSTEM AND METHOD FOR MONITORING PRINT CONSUMABLES OF A PRINTING DEVICE the specification of which,

(check one) _X_ is attached hereto.
___ was filed on _____ as Appln. Serial No. _____.
___ and was amended on _____.
___ was described and claimed in PCT International Application No. _____ filed on _____ and as amended under PCT Article 19 on _____.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is known to me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

PRIORITY CLAIM (35 USC § 119)

I claim foreign priority benefits under Title 35, United States Code, § 119(a-d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Number	Country	Day/Month/Year Filed	Priority Claimed
_____	_____	_____	Yes____ No___
_____	_____	_____	Yes____ No___

Prior Provisional Application(s)

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States Provisional Application(s) listed below:

Number	Day/Month/Year Filed
60/116,469	January 20, 1999
_____	_____

PRIORITY CLAIM (35 USC § 120)

I claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below. Insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code § 112, I acknowledge the duty to disclose to the Patent Office all information known to me to be material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Appln. Ser. No.	U.S. Serial No. (if any under PCT)	Filing Date	Status
_____	_____	_____	_____
_____	_____	_____	_____

DECLARATION

I declare that all statements made herein that are of my own knowledge are true and that all statements that are made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY

I appoint the following attorneys and agents to prosecute the patent application identified above and to transact all business in the Patent and Trademark Office connected therewith, including full power of association, substitution and revocation: Judson K. Champlin, Reg. No. 34,797; Joseph R. Kelly, Reg. No. 34,847; Nickolas E. Westman, Reg. No. 20,147; Steven M. Koehler, Reg. No. 36,188; David D. Brush, Reg. No. 34,557; John D. Veldhuis-Kroeze, Reg. No. 38,354; Deirdre Megley Kvale, Reg. No. 35,612; Theodore M. Magee, Reg. No. 39,758; Peter S. Dardi, Reg. No. 39,650; Christopher R. Christenson, Reg. No. 42,413; John A. Wiberg, Reg. No. 44,401; and Brian D. Kaul 41,885.

I ratify all prior actions taken by Westman, Champlin & Kelly, P.A. or the attorneys and agents mentioned above in connection with the prosecution of the above-mentioned patent application.

DESIGNATION OF CORRESPONDENCE ADDRESS

Please address all correspondence and telephone calls to **Brian D. Kaul** in care of:

WESTMAN, CHAMPLIN & KELLY, P.A.
Suite 1600 - International Centre
900 Second Avenue South
Minneapolis, Minnesota 55402-3319
Phone: (612) 334-3222 Fax: (612) 334-332

Inventor: _____ Date: _____
(Signature)

Inventor: Kevin R. Lilland
(Printed Name)

Residence: Prior Lake, Minnesota Citizenship: U.S.A.

P.O. Address: 4560 NE Embassy Circle, Prior Lake, MN 55372

(Signatures Continued on Next Page)

Inventor: _____ Date: _____
(Signature)

Inventor: Steven S. Hoge
(Printed Name)

Residence: Minnetonka, Minnesota Citizenship: U.S.A.

P.O. Address: 15110 Stone Road, Minnetonka, MN 55391-2410